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(72) Inventor:
**Leadbeater, John Michael
Strensall, York YO32 5AZ (GB)**

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(74) Representative:
**Borne, Patrice Daniel et al
Avenue Nestlé 55
1800 Vevey (CH)**

(71) Applicant:
**SOCIETE DES PRODUITS NESTLE S.A.
1800 Vevey (CH)**

(54) Method and apparatus for moulding a food product

(57) The present invention relates to a method and apparatus for the moulding and fast chilling of a food product, preferably a confectionery product. The method comprises the following steps a) depositing a solidifiable food product (5) into a series of moulds (2) attached to a chilled roller (3) wherein the food product at least partly solidifies in the mould, b) rotating the chilled roller (3) to move the series of moulds with food product into contact with a conveyor belt (6) sufficiently soon after deposition to prevent distortion of the exterior surface of the food product as the moulds move away from the horizontal and c) separating the at least partly solidified food product (1) from the moulds onto the conveyor belt. An alternative embodiment of the present invention comprises a method of moulding a food product (5) comprising the steps a) depositing a solidifiable food product sequentially into a series of moulds (2) attached to a chilled roller (3) wherein a chilled plate (12) is lowered onto the mould during deposition and whereby the food product at least partly solidifies in the mould b) rotating the chilled roller and c) separating the at least partly solidified food product (1) from the moulds.

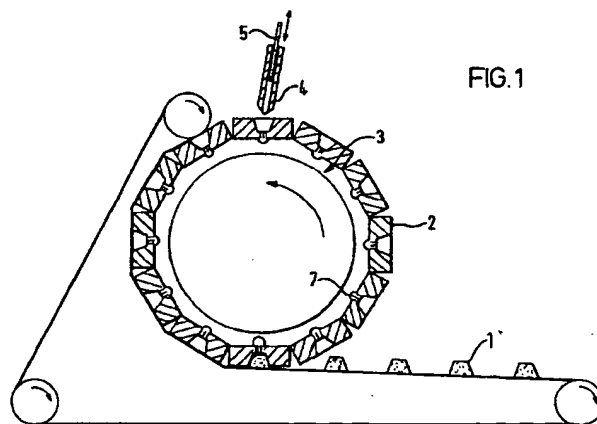


FIG.1

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Description

[0001] The present invention relates to the moulding of food products, in particular to the moulding of confectionery products such as gels, gums, high-boiled sweets, chocolate or fat-based products.

[0002] Food products, in particular confectionery products, have been produced using chilled rollers, such as in US 5,078,204 and GB 641,682, however the methods disclosed in these patents are directed to the use of pairs of counter-rotating rollers with cavities on their surfaces in order to form shaped confectionery products linked by a thin web of confectionery product. GB 641,982 is directed to the production of chocolate confectionery articles only and the problems associated with adherence of chocolate to surfaces. In US 5,078,204 the moulded product is in the form of a solid ribbon and requires further processing.

[0003] The present invention overcomes the problems associated with the formation of the web linking the moulded confectionery products and alleviates the need for further processing after moulding. In addition the present invention aims to provide a new method and apparatus for the moulding and fast chilling of food products with reduced mechanical complexity and a reduced number of moulds which results in the reduction of investment, floor space and maintenance costs and costs to change the shape of the moulds.

[0004] Accordingly, the present invention relates to a method of moulding a food product comprising the steps;

a) depositing a solidifiable food product sequentially into a series of moulds attached to a chilled roller wherein the food product at least partly solidifies in the mould;

b) rotating the chilled roller to move each mould with food product into contact with a conveyor belt sufficiently soon after deposition to prevent distortion of the exterior surface of the food product as the moulds move away from the horizontal; and

c) separating the at least partly solidified food product from the removable mould onto the conveyor belt.

[0005] According to this embodiment of the present invention the conveyor belt is arranged to wrap around the periphery of the moulds to prevent the exterior surface of the deposited food product from sagging as the moulds rotate away from the horizontal. Preferably the conveyor belt is arranged in contact with the exterior surface of the food product as soon as the moulds have moved an angle of no more than 90 degrees, preferably less than 60 degrees with respect to its position during depositing. The conveyor belt may constantly remain in contact with the moulds during an angular motion of the

moulds of at least 90 degrees, preferably at least 120 degrees until the food product is separated from the moulds.

[0006] A further embodiment of the invention comprises a method of moulding a food product comprising the steps;

a) depositing a solidifiable food product sequentially into a series of moulds attached to a chilled roller wherein a chilled plate is lowered onto the moulds during deposition and whereby the food product at least partly solidifies in the mould;

b) rotating the chilled roller; and

c) separating the at least partly solidified food product from the moulds.

[0007] According to this embodiment the method comprises lowering a chilled plate onto the mould during the deposition of the food product into the mould. If such a chilled plate is used the exterior surface of the food product will be sufficiently solidified to resist sagging and thus a conveyor belt will not be required.

[0008] According to both methods the separation of the at least partly solidified food product from the moulds may be carried out by an ejection means which may comprise means for the introduction of compressed air to a cavity behind each mould or through air nozzles at the bottom of each mould. The method may also optionally make use of a release agent in order to aid removal of the food product from the moulds.

[0009] The food product used may comprise warm fluid confectionery solutions or food ingredient solutions of a thermosetting nature, such as chocolate or high-boiled sugar. The food product is thus solidifiable and upon contact with the moulds on the chilled roller surface at least partly solidifies on the surface in contact with the moulds. This forms a skin on the outer surface of the food product even if it is not solidified at the centre and facilitates the easy removal of the solidified food product from the moulds.

[0010] The present invention is particularly suitable for food products, such as gels, gums, high-boiled sweets, chocolate or other fat-based confectionery products such as pralines which solidify preferably from 20 °C to 30 °C. The appropriate temperature of the liquid product and the roller temperature will depend on the product composition.

[0011] The present invention also relates to an apparatus for moulding food products comprising;

a chilled roller;

a series of moulds attached to the chilled roller;

a depositor for the sequential deposition of a solidifiable food product into the moulds in the horizontal

position;

a conveyor belt arranged in contact with the exterior surface of the food product in the moulds sufficiently soon after deposition to prevent distortion of the exterior surface of the food product as the moulds move away from the horizontal.

[0012] Preferably, the apparatus further comprises ejection means for ejecting the at least partly solidified food product from the moulds onto the conveyor belt.

[0013] An alternative embodiment of the present invention comprises an apparatus for moulding a food product comprising;

a chilled roller;

a series of moulds attached to the chilled roller;

a depositor for the sequential deposition of a solidifiable food product into the moulds in the horizontal position;

a chilled plate in contact with the mould during the deposition of the food product into the moulds.

[0014] The apparatus according to this embodiment may also comprises an ejection means for ejection of the at least partly solidified food product from the moulds.

[0015] In accordance with both embodiments of the present invention the series of moulds are arranged radially on the outer circumference of the chilled roller. The moulds used are preferably removable moulds which are individually separable from the chilled roller. The use of removable moulds according to the present invention enables the formation of various shaped food products dependant on the type of mould used. The moulds may comprise a single unit, with a plurality of recesses defined therein to form the plurality of moulds, arranged co-axially with respect to the chilled roller or may simply comprise a plurality of moulds arranged co-axially with respect to the chilled roller. Where a plurality of removable moulds are arranged co-axially with respect to the chilled roller the depositor is arranged in such a manner that the food product is deposited into each of the plurality of removable moulds at the same time.

[0016] Each single mould has a large surface area in contact with the chilled roller in order to enable heat transfer by conduction from the chilled roller to the mould. The moulds and chilled roller are made of material having good conductive properties.

[0017] Thus the present invention enables the use of a smaller number of moulds in comparison to traditional methods which require the use of several thousand moulds. This results in a reduction of the investment necessary and the use of removable moulds

results in a reduction of the cost to change shape. The floor space used is also greatly reduced in comparison to traditional methods. The rapid cooling due to conductive heat transfer gives high output and can reduce product changes during cooling, for example sugar inversion. In addition the reduced mechanical complexity reduces investment and maintenance costs.

[0018] The present invention will now be described in further detail by way of example only with reference to the accompanying figures.

Figure 1 is a schematic drawing of one embodiment of an apparatus for carrying out the method of the present invention.

Figure 2 is a schematic drawing of a further embodiment of an apparatus for carrying out the method of the present invention.

Figure 3 is a cross-section through line A-A of figure 2.

Figure 4 is a schematic drawing of a second embodiment of Figure 2.

Figure 5 is a schematic drawing of a third embodiment of Figure 2.

[0019] Figure 1 shows an apparatus for performing a method of moulding a food product 1 according to the invention. The apparatus comprises a series of moulds 2 attached to a chilled roller 3. A depositor 4 is provided for the deposition of the solidifiable food product 5 into the moulds.

[0020] A motor (not shown) is arranged to rotate the chilled roller 3 in the direction as shown. The roller may rotate continuously whilst the depositor system reciprocates the roller motion horizontally so as to get a static arrangement of the mould and depositor during the depositing cycle. Another option may be to have the roller motion linked to the depositing cycle so that the roller stops during the depositing cycle and starts again to put an empty mould under the depositor.

[0021] A conveyor belt 6 is provided in contact with the food product in the mould sufficiently soon after deposition to prevent distortion of the exterior surface of the food product as the filled mould moves away from the horizontal. The food product 5 at least partly solidifies after deposition into the mould and is then ejected by ejection means 7, preferably compressed air, onto the conveyor belt in preformed shapes 1.

[0022] Figure 2 shows an alternative embodiment of the present invention. The apparatus comprises a series of moulds 2 attached to a chilled roller 3. A depositor 4 is provided for the deposition of the solidifiable food product 5 into the removable moulds. A chilled plate 12 is arranged in contact with the exterior surface of the food product being deposited into the mould. A

motor (not shown) is arranged to rotate the chilled roller 3 as shown. The food product 5 at least partly solidifies after deposition into the mould and is then ejected by ejection means 7, preferably compressed air, from the moulds in preformed shapes 1. A conveyor belt, as shown, may be present to collect the moulded food product after ejection

[0023] In some cases, the conveyor belt can be used to separate the food product from the mould. For example, sticky products such as high-boiled sweets or chocolate can adhere to the conveyor belt and can be simply removed without the need to employ an ejection means.

[0024] Figure 3 shows a cross-sectional view through line A-A of Figure 2. From this cross-section it is apparent that there may be a plurality of moulds 2 arranged co-axially with respect to the chilled roller 3 with the depositor arranged in such a manner so that the food product is deposited by a series of individual depositors into each of the plurality of moulds at the same time. A conveyor belt 8, as shown, may be present to collect the moulded food product after ejection.

[0025] Figure 4 shows an alternative embodiment of the invention in which the ejection means comprise a perforated conveyor belt 8 through which a vacuum is drawn at the location the belt collects the moulded food product. The conveyor belt 8 includes a plurality of evenly distributed apertures. The belt is passed along the mould sufficiently close to the food product to ensure adherence of the food product with the belt when the vacuum is carried out. Vacuum is drawn from a vacuum source 9 positioned at a side of the conveyor belt opposite to the side of contact with the food product. The vacuum source includes a vacuum chamber comprising a cavity having a size adapted to ensure a vacuum distribution at the surface of contact of the food product. The vacuum chamber is reciprocated upwardly each time a mould is stopped in position at the vertical of the vacuum chamber. The depositing cycle and the vacuum cycle can be co-ordinated to be carried out at the same time according to an incremental motion of the roller.

[0026] Figure 5 shows another variant in which the ejection means comprises an articulated arm 10 which draws vacuum sufficient to remove the food product from the mould and to transport the moulded food to a conveyor belt 11.

[0027] Vacuum is externally drawn, in accordance with Figures 4 and 5 and compressed air pulsed from the moulds can also be used in combination with such an external vacuum.

[0028] The conveyor belt may be of plastic laminated construction and the series of moulds may be metallic. The roller is slowly revolving with a preferred rotation speed from 1 to 4 revolutions per minute for chocolate and fat-based confection.

[0029] It is preferred that the roller is chilled to main-

tain a cavity temperature in the range of about 5 to -25 °C. The roller is cooled by a coolant circulation comprising a glycol/water mixture and the moulds are cooled through heat conduction to the roller. Air conditioning is required around the chilled roller in order to avoid condensation and ice formation. The chilled plate is also cooled by circulation of a coolant such as water/glycol mixtures.

[0030] The food products may be removed from the moulds via an ejection means which comprise means for the introduction of compressed air to a cavity behind each mould or through air nozzles at the bottom of each mould. A release agent, such as food grade oil, may be required to aid release from the mould.

Claims

1. An apparatus for moulding a food product comprising;
 - a chilled roller;
 - a series of moulds attached to the chilled roller;
 - a depositor for the sequential deposition of a solidifiable food product into moulds in the horizontal position;
 - a conveyor belt arranged in contact with the exterior surface of the food product in the moulds sufficiently soon after deposition to prevent distortion of the exterior surface of the food product as the moulds move away from the horizontal.
2. An apparatus as claimed in claim 1 wherein the conveyor belt is arranged in contact with the exterior surface of the food product as soon as the moulds have moved an angle of no more than 90 degrees, preferably less than 60 degrees with respect to its position during depositing.
3. An apparatus as claimed in claim 1 or 2 wherein the conveyor belt constantly remains in contact with the moulds during an angular motion of the moulds of at least 90 degrees, preferably at least 120 degrees, until the food product is separated from the moulds.
4. An apparatus for moulding a food product comprising;
 - a chilled roller;
 - a series of moulds attached to the chilled roller;
 - a depositor for the sequential deposition of a solidifiable food product into moulds in the hor-

izontal position;

a chilled plate in contact with the mould during the deposition of the food product into the moulds.

5. An apparatus as claimed in any of claims 1 to 4 which further comprise an ejection means for ejection of the at least partly solidified food product from the moulds.

6. An apparatus as claimed in claim 5 wherein the ejection means comprises means for the introduction of compressed air to a cavity behind each mould or through air nozzles at the bottom of each mould.

7. An apparatus as claimed in any of claims 1 to 6 wherein the roller is chilled to maintain a cavity temperature of 5 to - 25 °C

8. An apparatus as claimed in any of claims 1 to 7 wherein the moulds are removable from the chilled roller.

9. A method of moulding a food product comprising the steps;

a) depositing a solidifiable food product sequentially into a series of moulds attached to a chilled roller wherein the food product at least partly solidifies in the mould;

b) rotating the chilled roller to move each mould with food product into contact with a conveyor belt sufficiently soon after deposition to prevent distortion of the exterior surface of the food product as the moulds moves away from the horizontal; and

c) separating the at least partly solidified food product from the moulds onto the conveyor belt.

10. A method of moulding a food product comprising the steps;

a) depositing a solidifiable food product sequentially into a series of moulds attached to a chilled roller wherein a chilled plate is lowered onto the moulds during deposition and whereby the food product at least partly solidifies in the mould;

b) rotating the chilled roller; and

c) separating the at least partly solidified food product from the moulds.

11. The method as claimed in claims 9 or 10 wherein separating comprises ejecting the at least partly solidified food product via an ejection means.

12. The method as claimed in claims 11 wherein the ejection means comprises means for the introduction of compressed air to a cavity behind each mould or through air nozzles at the bottom of each mould.

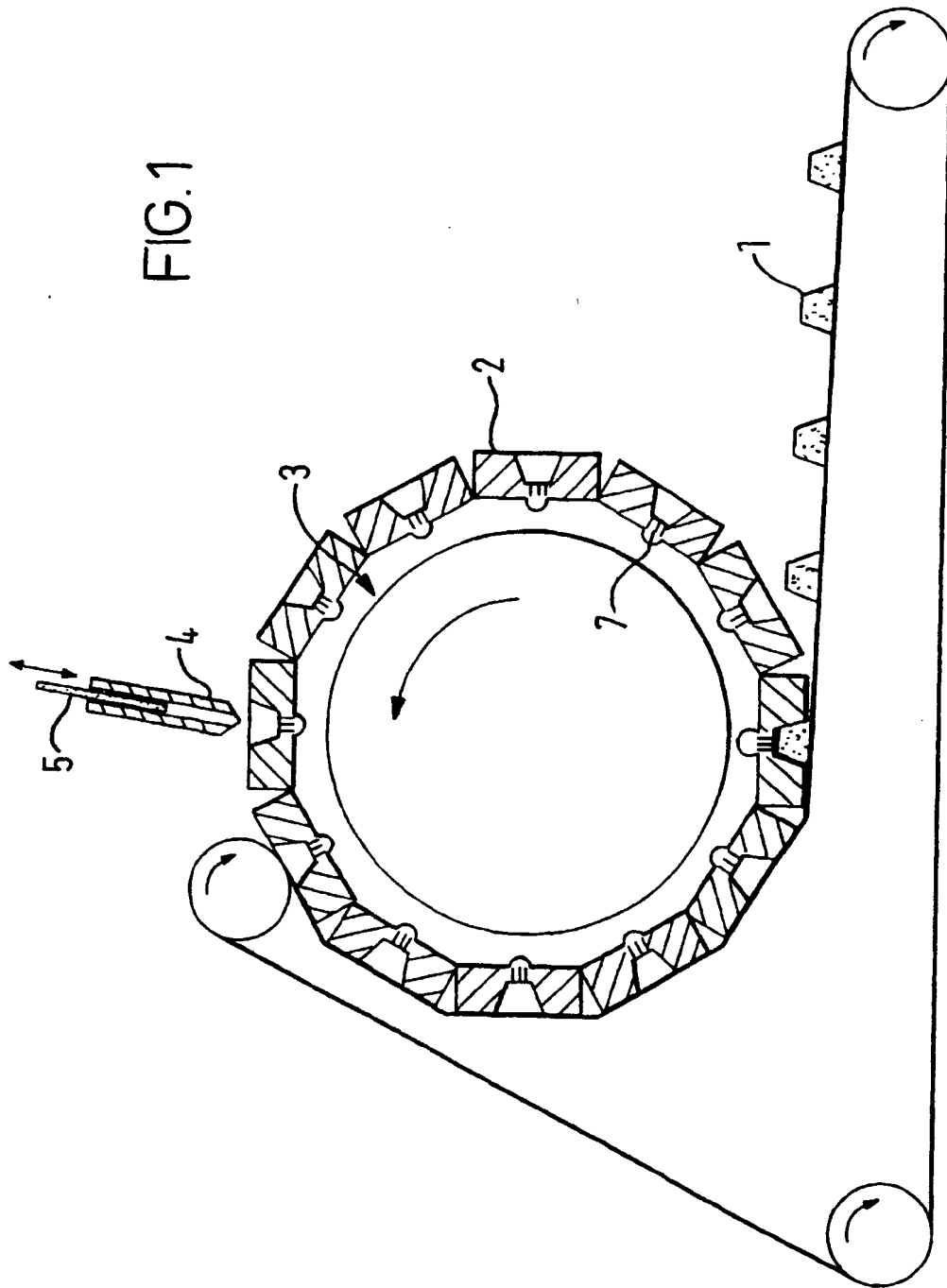
13. The method according to any of claims 9 to 12 wherein a release agent is used to aid removal of the food product from the moulds.

14. The method according to any of claims 9 to 13 wherein the roller is chilled to maintain a cavity temperature of 5 to - 25 °C.

15. The method as claimed in any of claims 9 to 14 wherein the food product is a confectionery article, preferably a chocolate or a fat-based confection.

16. An apparatus for moulding a food product substantially as shown in and/or described with reference to any of figures 1 to 5 of the accompanying drawings.

17. A method for moulding a food product substantially as described with reference to any of figures 1 to 5 of the accompanying drawings.



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FIG. 2

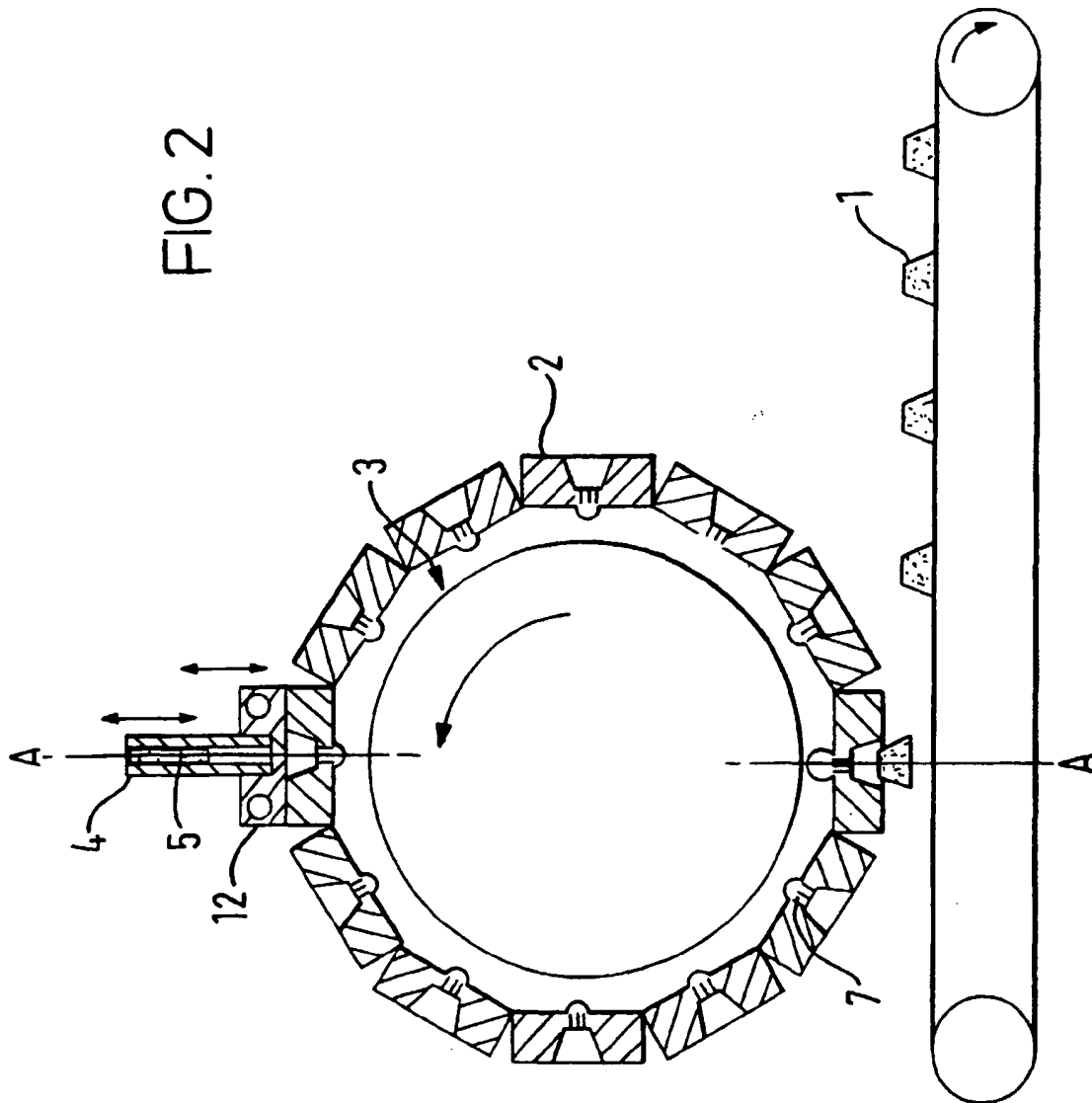
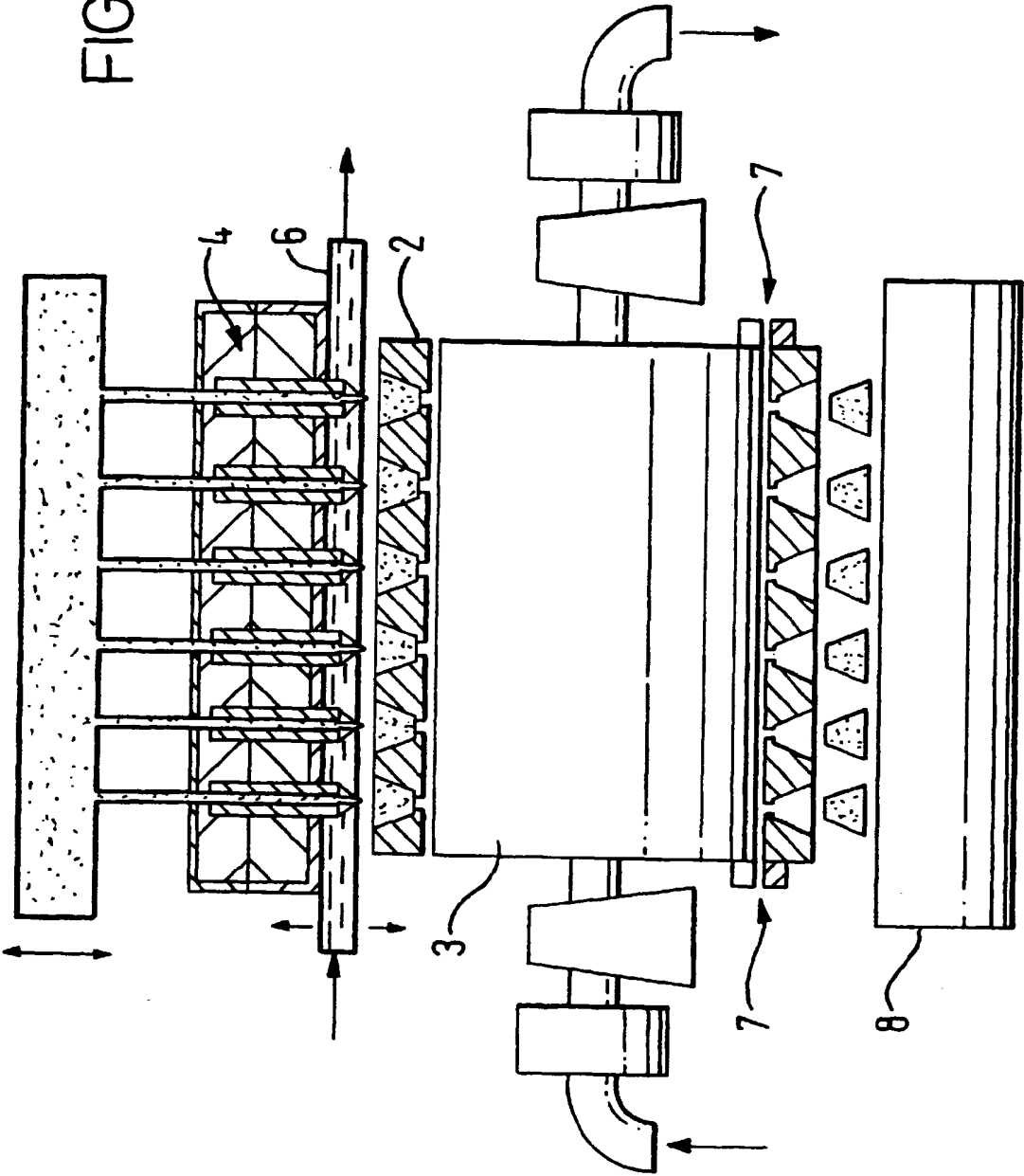


FIG. 3



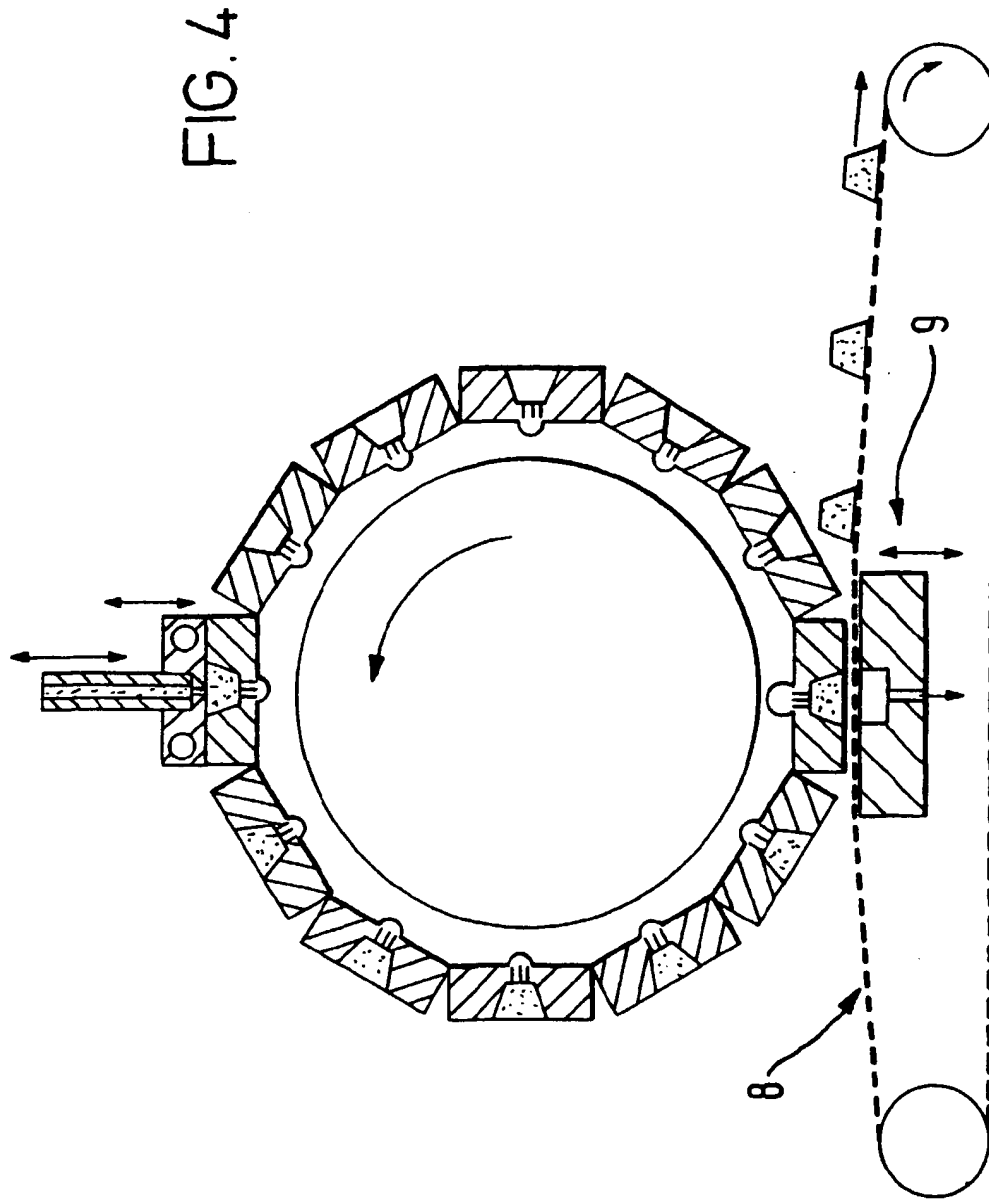
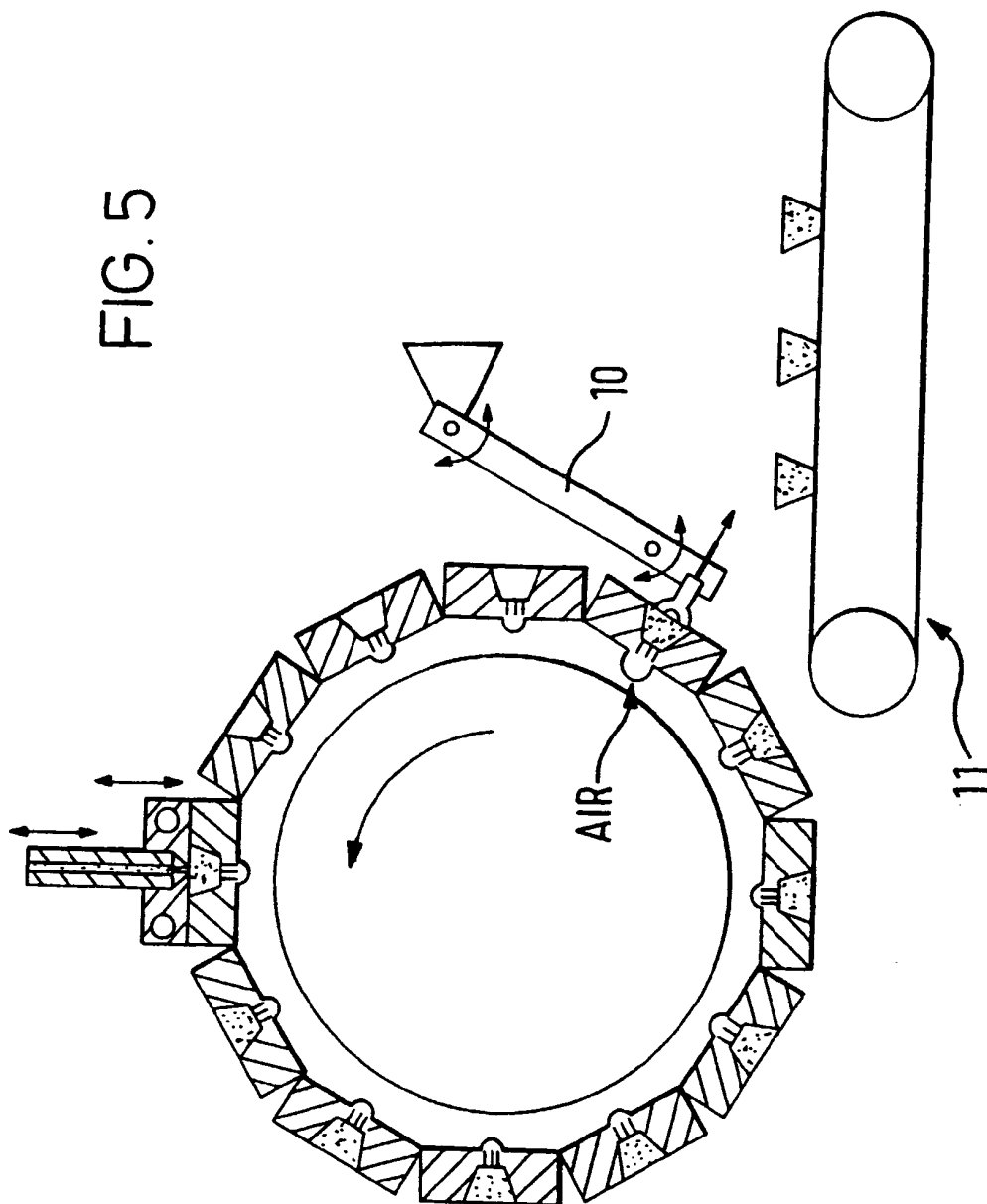


FIG. 5



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EUROPEAN SEARCH REPORT

Application Number
EP 00 20 0845

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 26 September 2000	Examiner Guyon, R
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EPO FORM 1503 03 82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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